

Two-pulse Rapid Remote Surface Contamination Measurement

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Problem

There is a need to remotely (3-m-standoff) sense low-volatility chemical contaminants on surfaces

Applications

- Low-volatility chemical agent (LVA, e.g., VX) detection during:
 - Decontamination activities
 - Battlefield sensing of "denied" territory
- Radiological material ("dirty" bomb) detection
- Biological agent residue detection

Potential customers and areas:

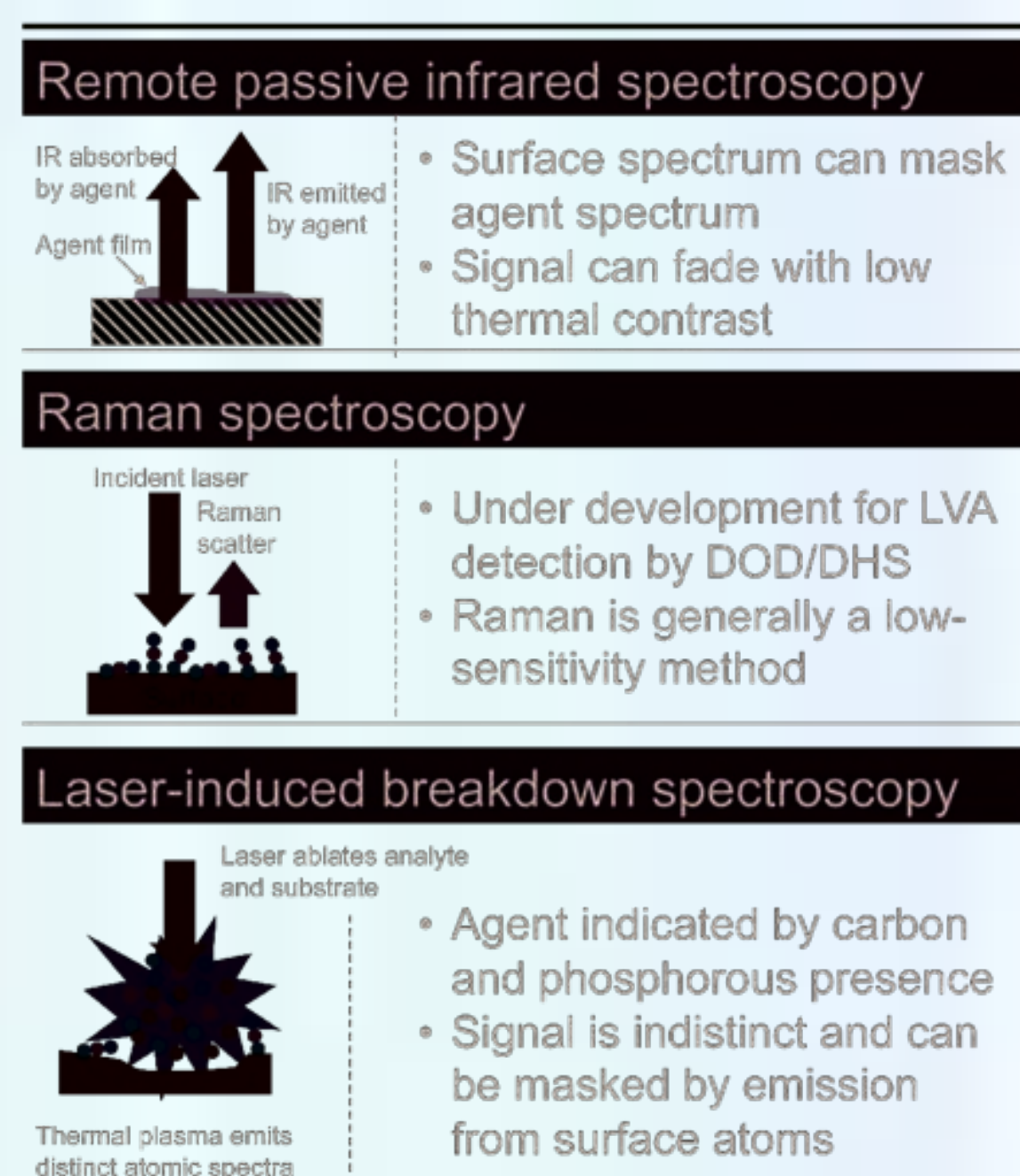
- DTRA — Chemical, biological, nuclear
- DHS — Chemical, biological
- DNDO — Nuclear



Vehicle decontamination

We are focusing on LVA detection

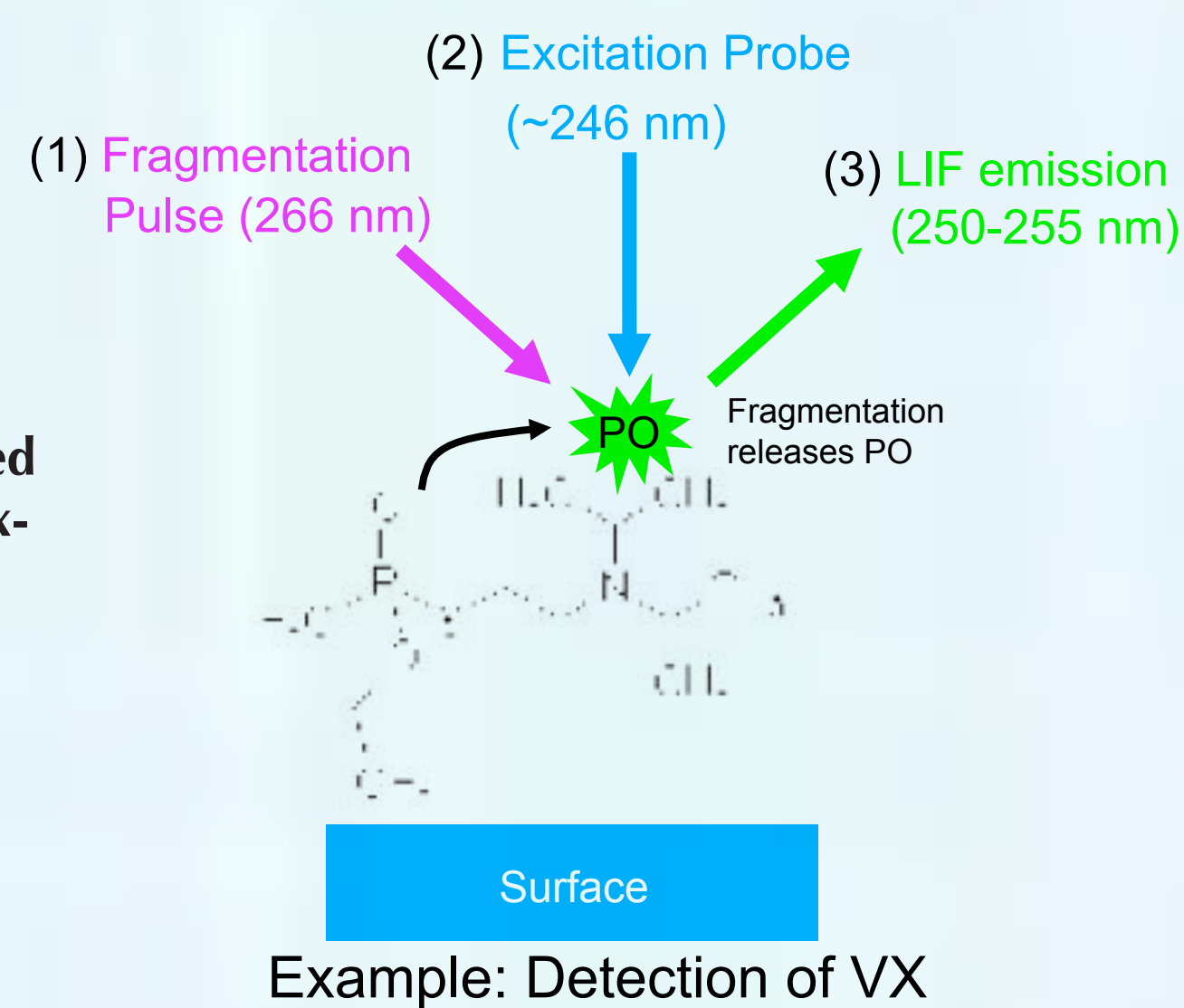
Existing methods are limited in performance for CWA detection



Approach

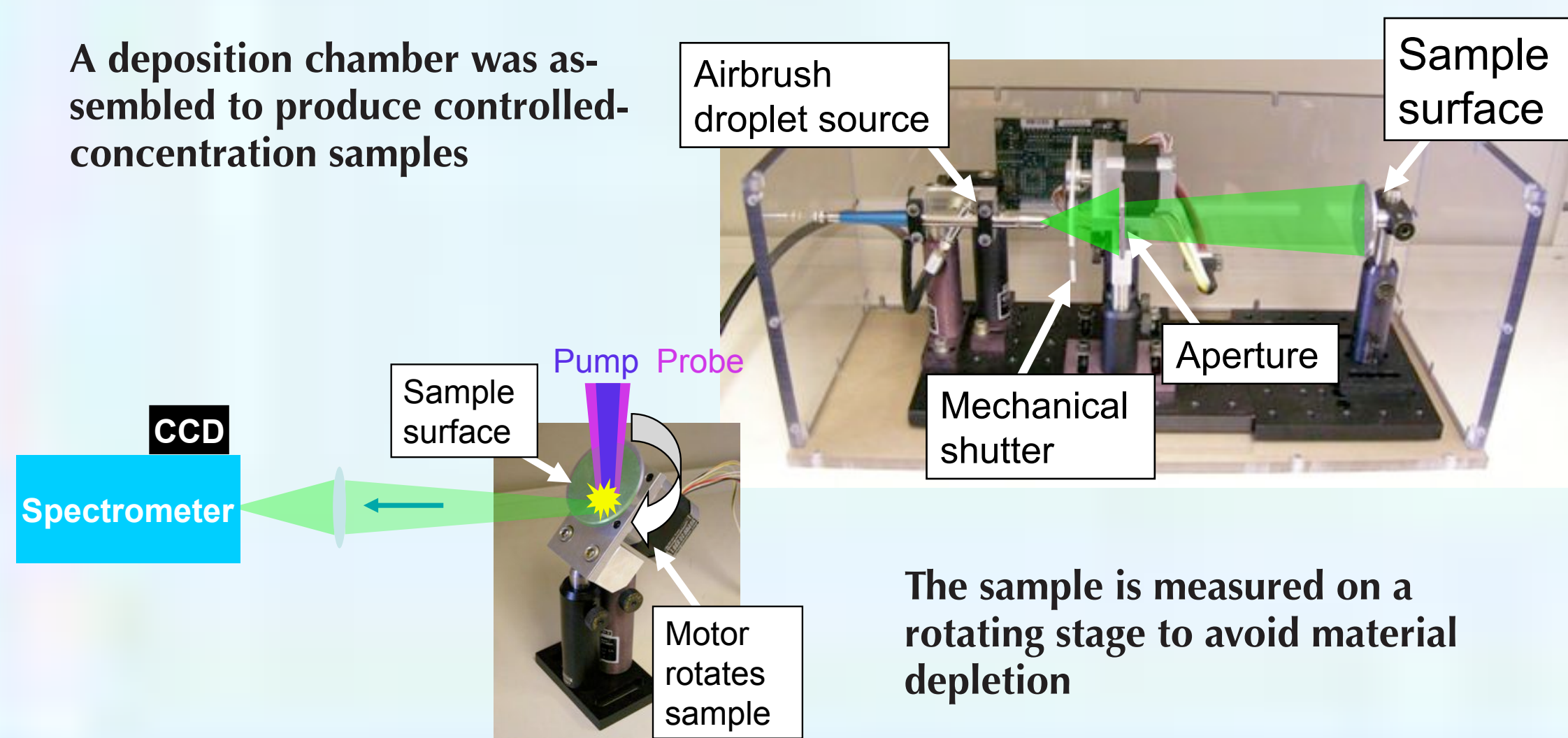
We are developing a pulse-probe method for LVA detection:

Method has been demonstrated in the vapor phase – we are extending it to measurement of surface agents



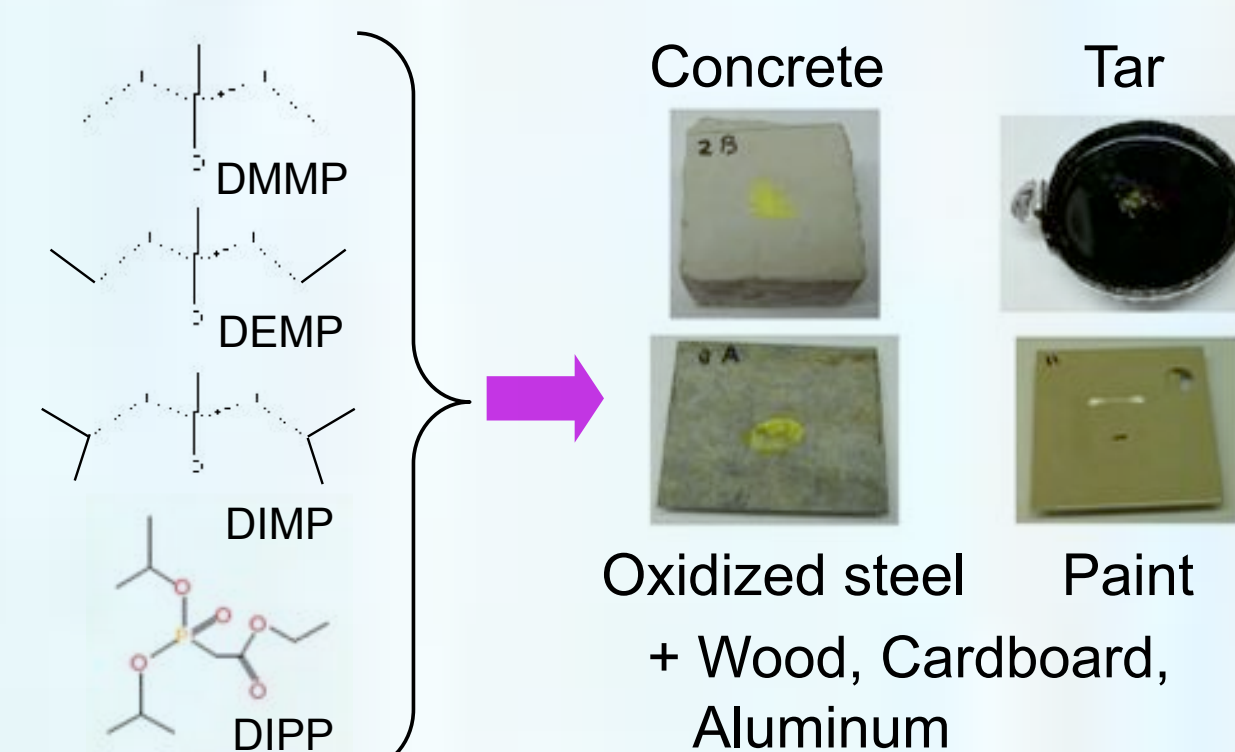
Results

A deposition chamber was assembled to produce controlled-concentration samples



Results (cont.)

Detection of four simulants has been demonstrated on 7 substrates*

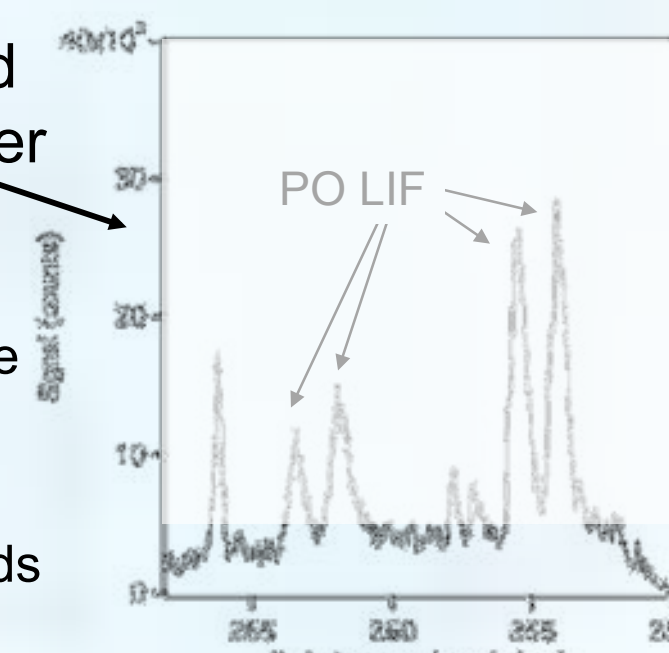


DMMP on oxidized steel - one day after droplet deposited

Pump = 200 μ J / pulse

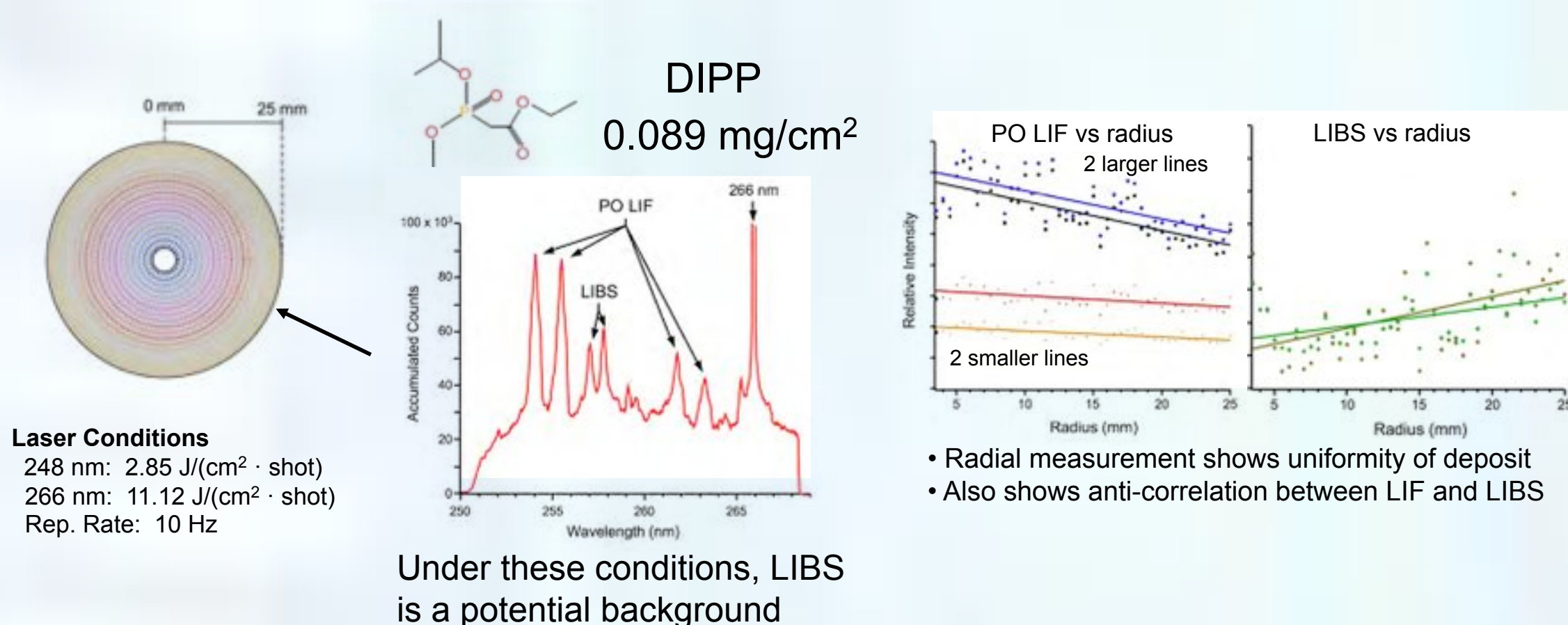
Probe = 25 μ J / pulse

Integration = 3 seconds

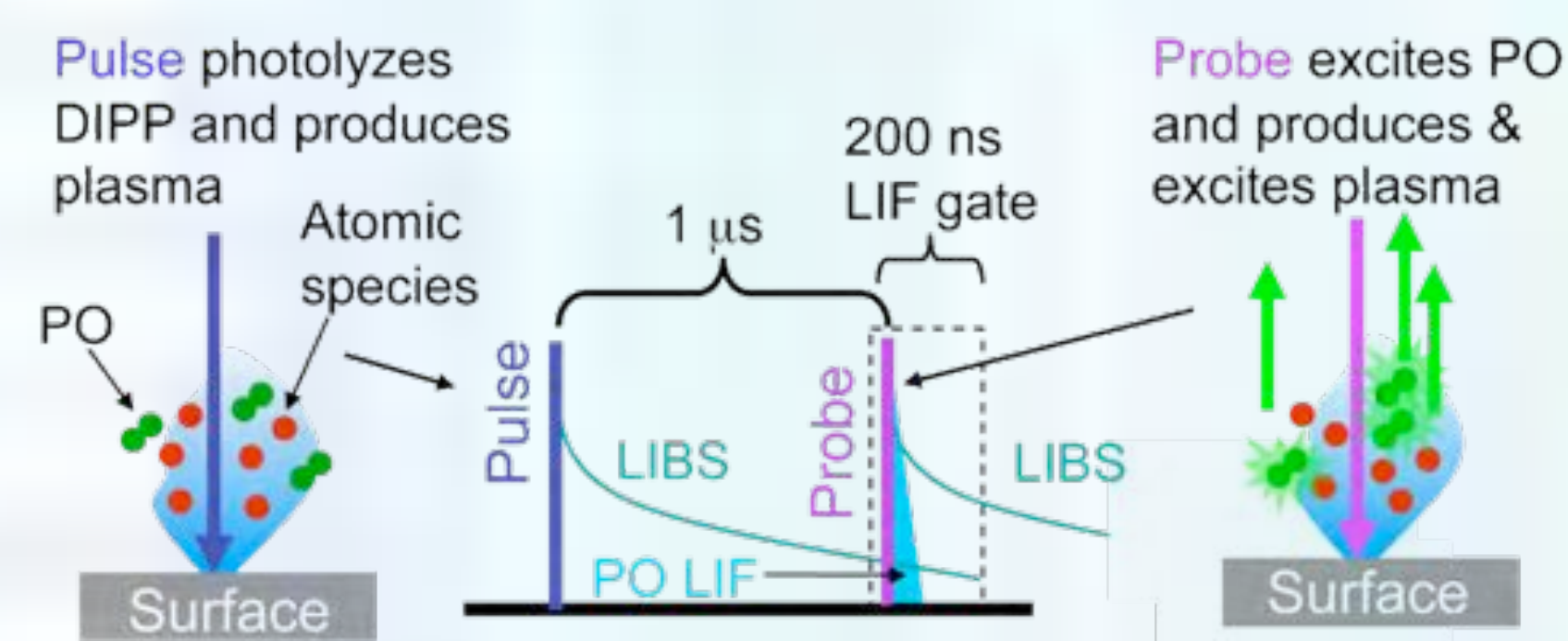


*Not all quantitatively

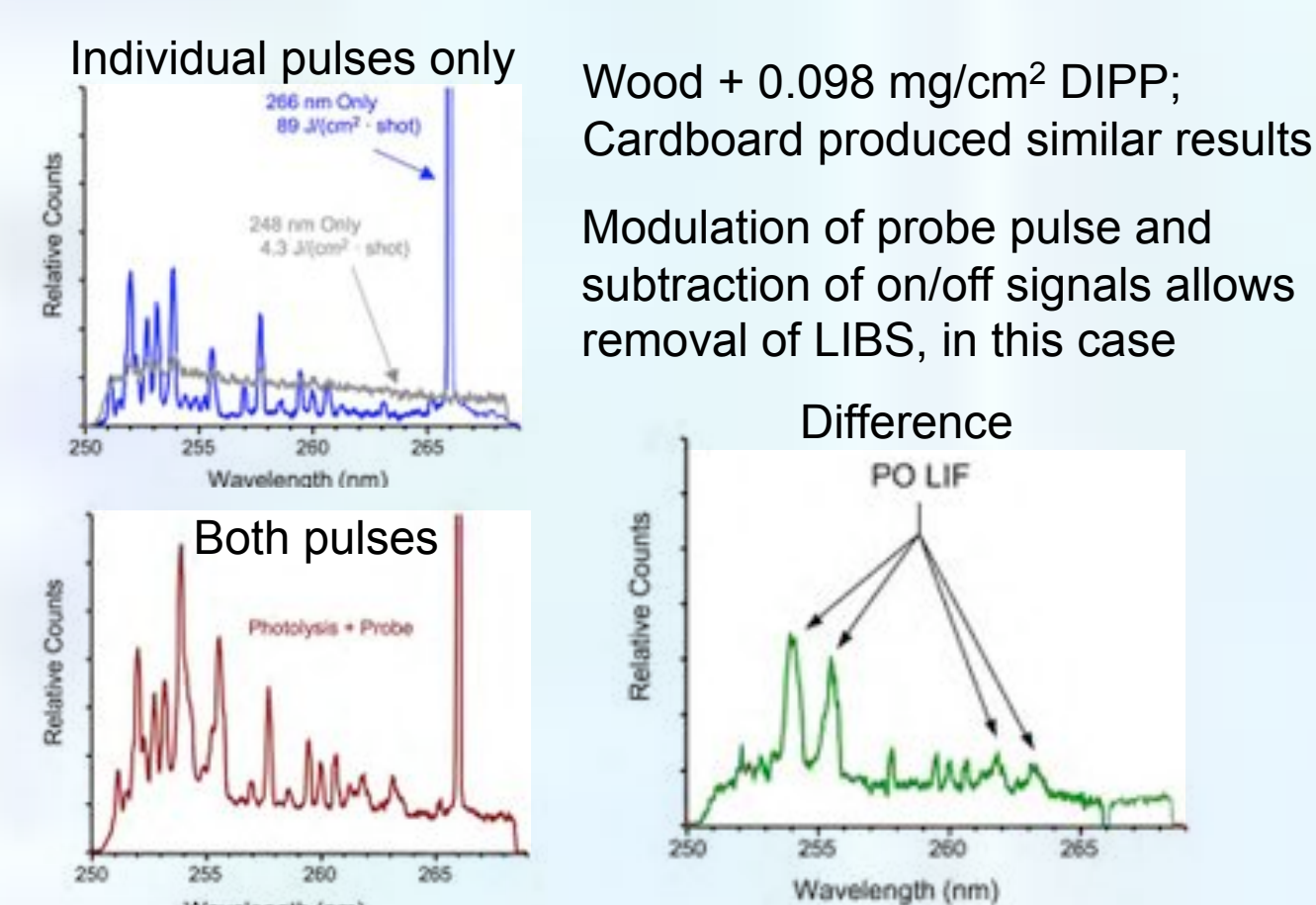
Quantitative detection of DIPP on aluminum



Mitigation of LIBS is a priority



In some cases, LIBS can be modulated and subtracted



Significance

- Pulse-probe method, previously demonstrated in vapor phase, is also applicable to surface measurement
- Method releases and detects PO from multiple organophosphate species on various surface materials
- A quantitative evaluation is underway to determine the sensitivity of the measurement
- Optical emission caused by surface LIBS is an interfering signal
- FY10 work will focus on minimizing or eliminating the LIBS background